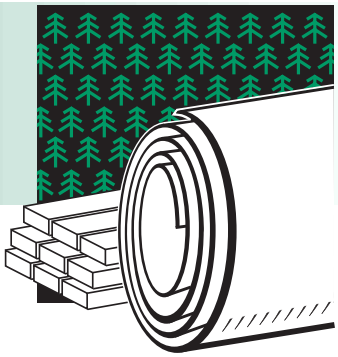
FOREST PRODUCTS

Project Fact Sheet



HIGHER SELECTIVITY OXYGEN DELIGNIFICATION

BENEFITS

- Increases pulp viscosity, leading to approximately 50 percent higher selectivity
- Improves fiber strength an average of 10 to 15 percent, with savings of $30/ton or $11 million/year in a 1,000 tpd bleached pulp mill operation
- Increases yield by 1 to 3 percent, saving at least $4/ton
- Improves bleaching
- Reduces number of bleaching stages, worth $20 million for a 1,000 tpd mill, if delignification increases 20 percent with no change in pulp viscosity
- Saves 17 million kWh per unit each year

APPLICATIONS

Approximately 26 Kraft oxygen pulp mills, with a total capacity of 33,000 tons/day, are currently in operation in the United States. This technology can be retrofitted easily into each of these operations. The projected market share is 100 percent.

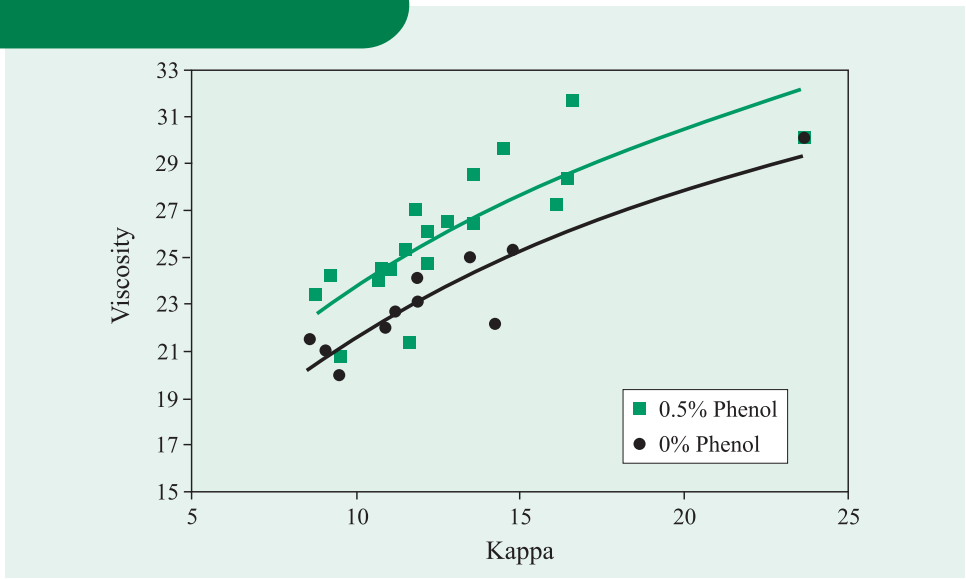
PROPRIETARY CHEMICAL ADDITIVE CONTROLS RADICALS THAT CAN DIMINISH DELIGNIFICATION SELECTIVITY

Oxygen delignification is utilized in pulping operations to reduce kappa, maintain pulp strength, reduce shives, and minimize environmental emissions. Almost 40 percent of the bleached pulp market uses oxygen delignification, which delignifies kraft pulp to about 35 to 50 percent of its original lignin content. However, further delignification by this process is limited because of complex oxidative reactions that produce radicals, which degrade the pulp carbohydrates and reduce pulp viscosity, fiber strength, and yield.

Researchers at the Institute of Paper Science and Technology (IPST) have identified a “chemical protector” system of magnesium sulfate and phenol that controls these degradation reactions in oxygen-delignified pulp. In laboratory demonstrations of this innovative system, pulp viscosity increased 20 to 50 percent, fiber strength improved 10 to 15 percent, and yield increased up to 3 percent. If implemented industry-wide, this technology will increase the selectivity of delignification significantly and permit enhanced oxygen delignification that will eliminate at least one bleaching stage. Installation of the technology will not require any capital modifications to existing plants.

The technology has the potential to improve industrial oxygen delignification operations, and provide economic and environmental benefits to the U.S. pulp and paper industry.

FIGURE 1.



Viscosity versus kappa between a series of phenol-treated softwood pulps.

Project Description

Goal: To evaluate the commercial applicability of higher selectivity oxygen delignification processes through intensive laboratory studies and an accompanying mill trial.

The objectives of the project are to (1) show that the chemical protector system substantially improves selectivity in a mill setting; (2) gain more flexibility in oxygen operations with respect to time and temperature, while maintaining the physical properties of pulp; (3) retain fiber strength and increase pulp yield; and (4) improve pulp bleaching.

IPST will move forward on two fronts in conducting this one-year project. Laboratory-scale oxygen delignification will be performed on the kraft pulps manufactured at the Potlatch Corporation's Lewiston Mill, establishing a baseline of their physical and chemical properties; and the IPST will collaborate with Sunoco and Potlatch to determine the best method(s) for conducting mill trials using the required chemicals and testing protocols. Other tasks will include implementing the oxygen delignification system at the oxygen tower, measuring the final properties of the pulp, and conducting a cost-benefit analysis.

Critical points during the project include establishing the viability of the protector system using Potlatch pulps, ensuring environmental compliance of the chemical system and its compatibility with bleaching operations, determining the time for the chemical scale-up and mill trail, and establishing how the chemicals will be added.

Progress & Milestones

- Sunoco has agreed to provide the chemicals, mill service, and expertise to run the mill trial.
- Significant recent research findings indicate that the phenol additive undergoes little decomposition and may participate in a catalytic delignification and carbohydrate protection cycle.
- The first quarter will be devoted to collecting industrial pulps.
- The laboratory-scale oxygen delignification of pulps will be conducted in the second and third quarters, using statistical analysis to evaluate results.
- A milestone during the third or fourth quarter will be to obtain the selectivity, strength, and yields that will determine the experimental conditions for the mill trial.
- The mill trial will take place in the fourth quarter.
- The final outcome will be a comprehensive assessment of the value of the protector system on the selectivity of oxygen delignification and bleachability for North American bleaching operations.
- The measure of success will be improvements in the physical and chemical properties of the pulp.

Project Partners

Institute of Paper Science and Technology
Atlanta, GA

Potlatch Corporation
Cloquet, MN

International Paper
Tuxedo, NY

Alabama Pine Pulp Company, Inc.
Perdue Hill, AL

Sunoco Chemicals
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